

**Project Title:**

Facular Studies to Improve Reconstruction and Prediction of Solar Irradiance

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Our proposed study has three aims: 1. The recent balloon flight of the Solar Bolometric Imager (SBI) provides the first wide band images of the photosphere, creating an important opportunity to improve models of total irradiance variation. We propose to use SBI measurements of facular and spot contrast, together with ground-based and MDI magnetograms and photometry, to determine whether photospheric magnetic structures can account for rotational and 11-yr irradiance variation, or whether other mechanisms such as convective stirring might contribute. 2. Our recent reconstruction from archival CaK images indicates that solar total and UV irradiances differ significantly between 1915-1999 - a finding of key interest to climate modellers and aeronomers. We propose here to extend this reconstruction by using the white light facular area record compiled at Royal Greenwich Observatory between 1874-1976. Our aim is to compare the relative correlations with climate of the reconstructed UV and total irradiances, throughout the period of global warming, in order to assess their relative importance in driving recent climate. 3. The ratio of spot and facular areas early in a spot cycle has been shown to provide a good predictor of sunspot cycle amplitude in the 1874-1976 RGO data. It is also a key factor determining 11-yr irradiance variation. Our aim is to measure this ratio on WL images obtained at the onsets of cycles 22-23, to determine the more recent "skill" of this predictor, use it predict activity and irradiance levels in the forthcoming cycle 24, and study its implications for future non-axisymmetric, solar dynamo modelling.

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